

NASA WxAP and End Users Successes, Challenges and Opportunities

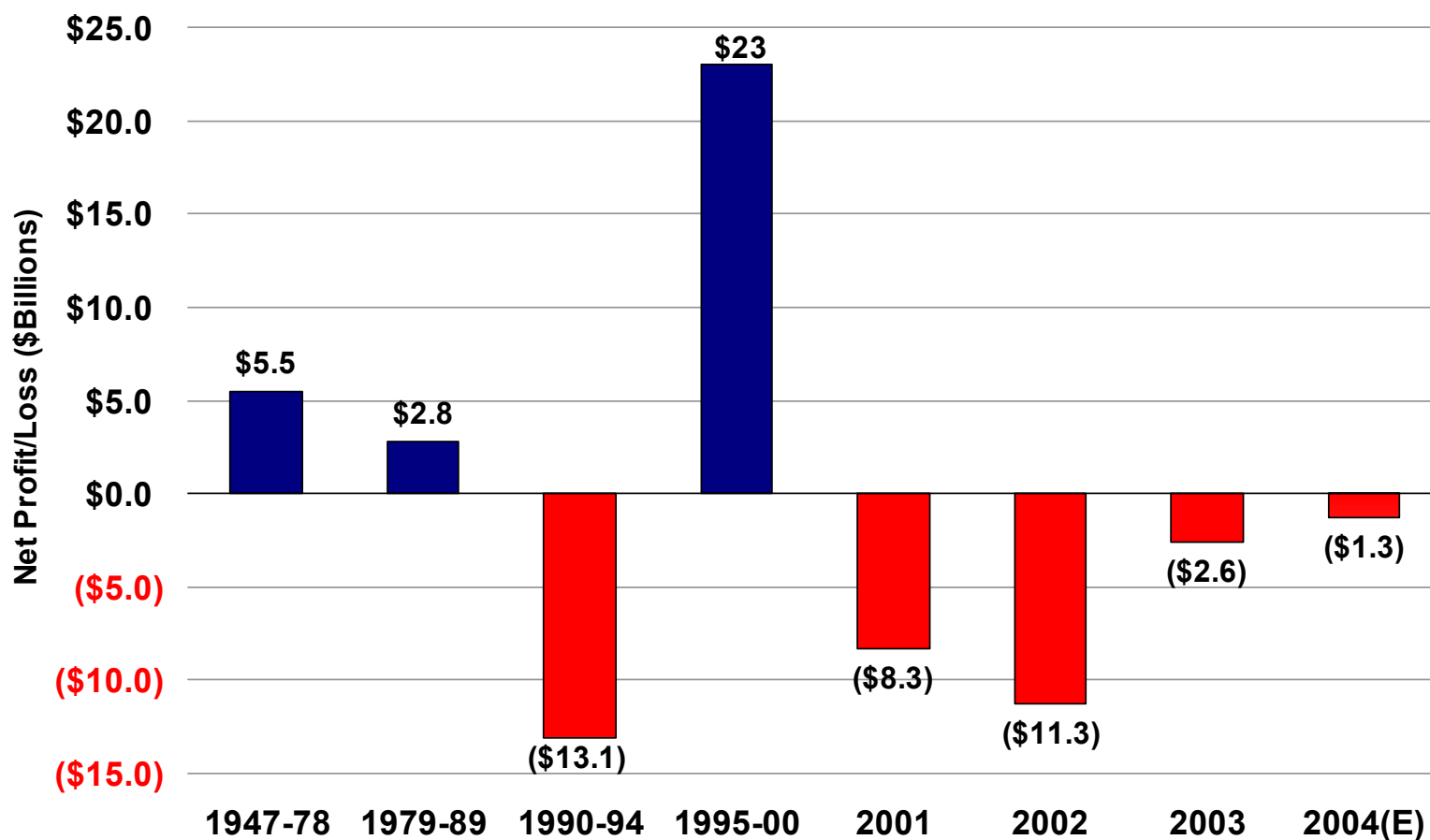
NASA WxAP Project Review

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Captain Lawrence A. “Bud” Sittig, Director, Flight Safety
Delta Air Lines

Airline “Earnings” = Cumulative Net Loss

Net Loss for 2001-04 Will Exceed Net Profit for 1995-2000





Drivers for Adopting New Technologies at Airlines

1. Safety
2. Compliance
3. Return on Investment – within 24 months

Delta Air Lines Turbulence Initiatives

1. Eddy Dissipation Rate (EDR) product - National Center for Atmospheric Research

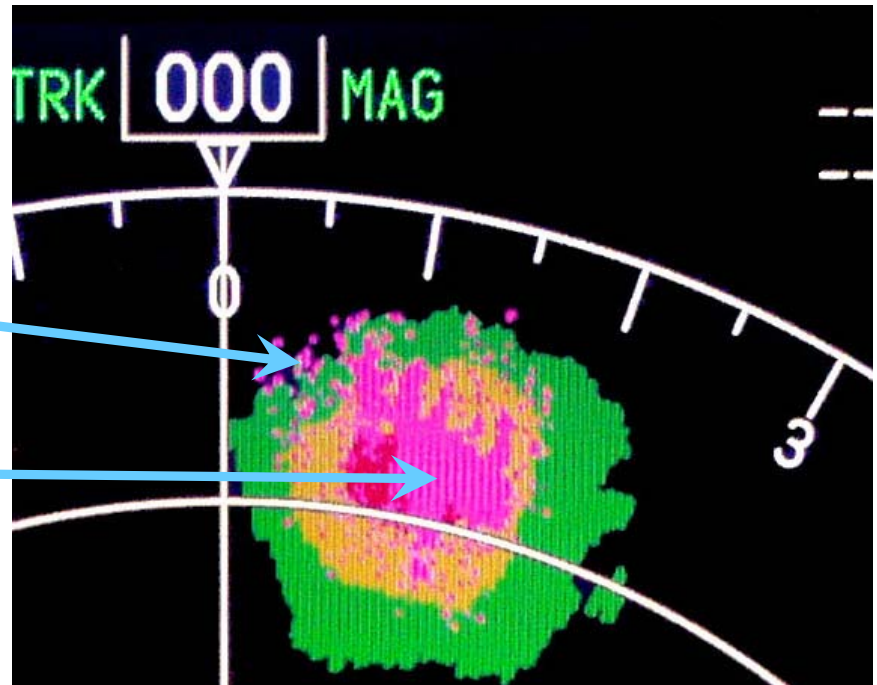
NASA Turbulence Prediction and Warning Systems (TPAWS)

2. Enhanced Turbulence Radar – NASA, Rockwell Collins, AeroTech Research
3. Turbulence Auto PIREP (Pilot Report) System (TAPS) – NASA, AeroTech Research

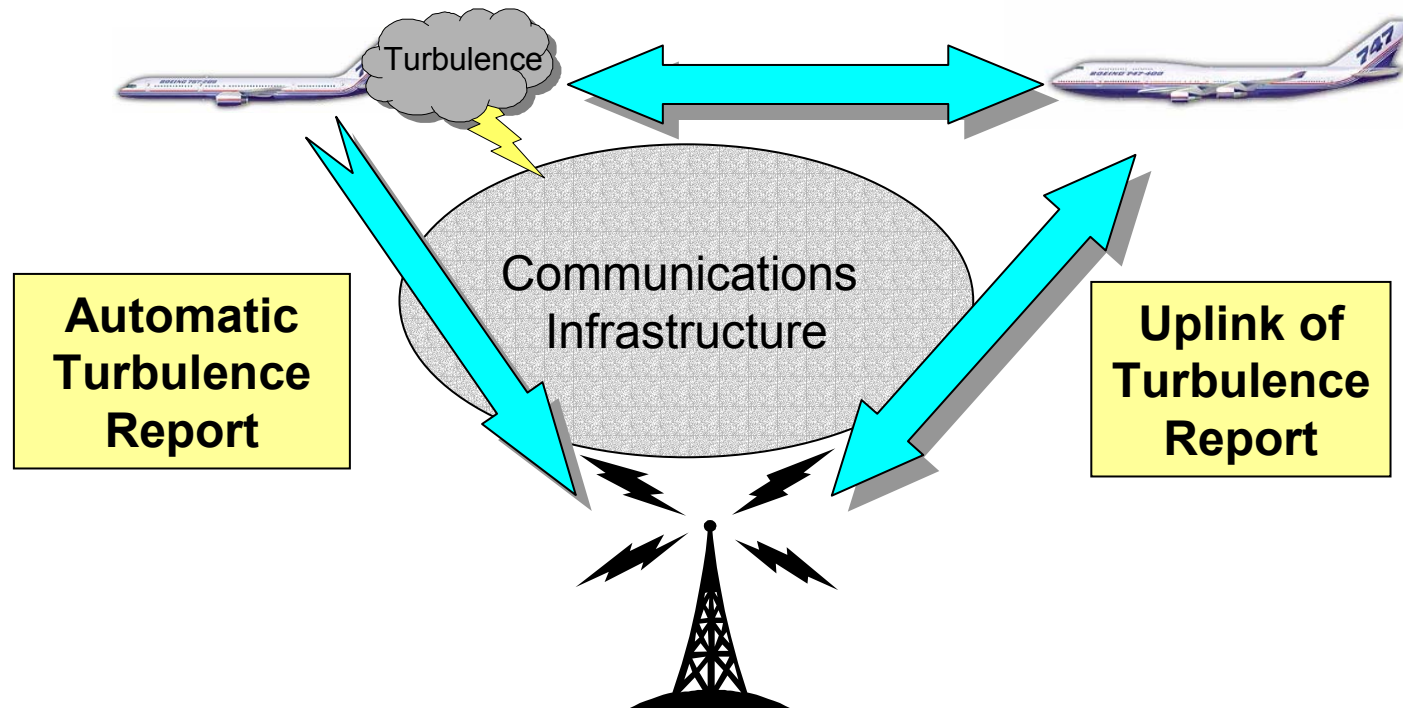
Rockwell Collins/AeroTech Enhanced Radar

Two Levels of turbulence (magenta)

1. Less severe (speckled)
2. More severe (solid)



Turbulence Auto PIREP System (TAPS) - AeroTech



Groundstation Network: Flight Following & Flight Planning

Immediate Benefits of Products

- Far better turbulence hazard awareness among a wide range of aviation users
- Significant operational enhancement in areas near turbulence
- NASA reporting product may yield potentially significant savings to the airline in the area of maintenance

Airline Industry Vision of the Future

- Autonomous systems that lower workloads and reduce reliance on costly ground based infrastructure
 - Products that automate the dissemination of turbulence information
 - Better datalinks
 - ADS-B
 - CPDLC

Challenges Facing the Industry

- Capacity constraints
 - Air traffic forecast to increase 65% between 2003 and 2015
 - Overall traffic returns to pre 9/11 levels in 2004
 - 641 million people flew in 2003, more than 1 billion expected in 2014
- Declining Yields
 - Domestic passenger yields to fall an average of .9% annually through 2015
- Weather Hazards Persistent and Costly
 - Weather hazards to degrade capacity even further
 - Weather accounts for 70-75% of all delays
 - Delays cost airlines \$6.5 billion in 2000

Using Turbulence Products to Meet Current and Future Challenges

- Capacity Enhancement/Delay Reduction
 - Turbulence reporting products, enhanced radar offer potential to “thread the needle” near convection and other areas of turbulence
 - This technology will be especially important as the efficient use of airspace becomes more critical in the years ahead

Tactically, How Should Products Be Used?

1. “Warning” Systems (e.g. TCAS)

- May delay deployment of already useful products
- Will drive up development costs significantly

2. Advisory Systems

What Can Airlines Contribute to Research Efforts?

- Key expertise in line operational environment
- Platform of on-the-job aircraft

Conclusion

- Delta, NASA partnership is a model worth celebrating
- Future research efforts must address questions of affordability
 - Autonomous systems, including turbulence products, meet this requirement
 - Turbulence products have broader applications that combat future industry challenges along these lines
- In making ideas marketable, end user contribution just as important as money within agency funded initiatives